THE AMERICAN

JOURNAL OF PHARMACY

NOVEMBER, 1913

EXPERIMENTAL WORK IN AN ENGLISH HERB GARDEN.

By Francis H. Carr, F.I.C.

Investigators in the domain of agricultural chemistry have devoted a greater measure of attention to the productiveness of the soil than has been given to the chemical composition of the crops concerned. From this generalization we must, however, except to some extent those workers engaged upon the study of sugar-producing crops by whom great success has been achieved in raising the percentage of sugar in root crops.

In the case of medicinal plants there is much need for investigations of this character and this need is rapidly becoming greater as it becomes more forcibly understood that the medicinal value of different samples of the same drug may vary enormously.

It is this latter consideration which has led to the increasing demand for the standardization of drugs and of their preparations, an advance for which pharmacy owes much to the compilers of the eighth revision of the United States Pharmacopœia.

Whether or not an extension of our knowledge in the direction indicated will ever render it possible in a practical way to control the amount of active principle present in a plant grown under cultivation, it must be admitted that the investigation of such a problem is of great practical importance as well as of deep scientific interest.

In work of this character there are so many variable factors concerned that before generalizations may safely be considered, we require to make a vast accumulation of accurate data, and such accumulated results are not yet available.

At the Wellcome Materia Medica Farm, situated at Dartford, Kent, England, investigations on these lines have been proceeding for the past eight years.

In the following short account of these investigations, is included a record of the more recent results, hitherto unpublished.

For obvious reasons the investigation of those plants which owe their medicinal value to some compound such as an alkaloid, a glucoside or an essential oil which can readily be determined, is the most suitable to undertake. At the Wellcome Materia Medica Farm attention has mostly been devoted to alkaloid-producing plants.

The land employed is situated on chalky hills and has a south-west aspect. The soil is light, permeable and chalky. The following is an analysis of a representative sample of the dry soil after removing pebbles, etc., which represent about 20 per cent. of its weight:

$CaCO_3$	11.4 per cent.
K_2O	0.4 per cent.
Fe_2O_3 and Al_2O_3	6.2 per cent.
H_3PO_4	0.6 per cent.
Total loss on ignition	9.5 per cent.
Insoluble in acids	72.2 per cent.

The photographs which are here reproduced, showing crops of belladonna and hyoscyamus, will serve to convey a general idea of the surroundings of the farm.

The experiments have been made in most detail in the case of *Atropa Belladonna,* but before describing them a brief review of other work may be given. An analysis of the dried stem and leaf of *Cytisus Scoparius* (Broom), gathered monthly during twelve months, was made by Carr and Reynolds (*P. J.*, 1908, **80**, 542).

The results, which are recorded below, prove in a conclusive manner that in this instance the plant stores up its alkaloid during the quiescent months of autumn and winter and that it rapidly disappears from the stem and leaf during the growing and flowering period.

ANALYSIS OF BROOM-TOPS.

August	0.07 per cent. Sparteine Sulphate
September	0.17 per cent. Sparteine Sulphate
October	0.34 per cent. Sparteine Sulphate
November	0.46 per cent. Sparteine Sulphate

December	0.36 per cent.	Sparteine Sulphate
January	0.36 per cent.	Sparteine Sulphate
February	0.38 per cent.	Sparteine Sulphate
March	0.53 per cent.	Sparteine Sulphate
April	0.44 per cent.	Sparteine Sulphate
July	0.23 per cent.	Sparteine Sulphate

Chevalier, who, since the publication of these results, has confirmed them, has suggested (*Compt. Rend.*, 1910, **150**, 1068) that

FIG. 1.

Hoeing Belladonna. Wellcome Materia Medica Farm.

the change is due to the alkaloid wandering into the fruit. Since the weight of fruit is so small in relation to the weight of stem and leaf and the percentage of sparteine found in it is only about twice that lost by the stem, this explanation does not, however, account for the whole of the alkaloid lost.

Digitalis is a biennial plant and it is usual only to employ in pharmacy leaves gathered from it in the second year of growth as directed by most pharmacopœias; moreover, it is commonly supposed

that the leaves from cultivated plants are inferior to those obtained from the wild plant; we have not been able to find, however, that these requirements have any rational foundation, for first and second year's leaves, grown side by side, have proved identical in their activity and the cultivated leaves are at least as active as those grown wild. As no practical method of chemically testing digitalis is known, the minimal lethal dose (for frogs) has been determined and the plant cultivated on the Wellcome Materia Medica Farm has

FIG. 2.

Gathering Belladonna. Wellcome Materia Medica Farm.

yielded a B.P. tincture having an M.L.D. of 0.4 c.c. per 100-grams on a three-hour test, thus showing that it is possessed of a very high degree of activity.

Hyoscyamus niger is also a biennial plant of which it is an official requirement that the second year's growth should alone be employed, yet as regards the activity we find the percentages of alkaloid contained in plants of first and second year's growth are identical, thus, there was found:

First year's growth.... 0.12 per cent. total alkaloid in the dried herb.
Second year's growth.. 0.12 per cent. total alkaloid in the dried herb.

Experiments to determine what conditions are best suited to the production of alkaloid have been made both with hyoscyamus and belladonna; it will suffice our purpose if we give some account of experiments made with the latter plant.

In the near vicinity belladonna was occasionally found growing

FIG. 3.

Gathering Hyoscyamus. Wellcome Materia Medica Farm.

wild before these experiments were undertaken which indicated, what was in fact found to be the case, that the soil was very well suited to the plant. Dissemination of the seed by birds has since made its occurrence still more common.

Wild belladonna plants were obtained from various parts of England and after propagating these for two years, one strain, found to yield a high percentage of alkaloid and to give good growth, was selected and exclusively employed. It has been stated by many observers that the cultivated belladonna plant contains less alkaloid

than that which grows wild. This statement, which is no doubt true of plants transported to a soil unsuited to them, has not been confirmed by the author's experience, indeed on the whole the cultivated plant has been found to contain a little more alkaloid than that grown wild. The percentage of alkaloid found in the leaves and stem of the dried wild plant was 0.49, while the average of that found in the cultivated plant during the eight years 1906-

FIG. 4.

Gathering Hyoscyamus. Wellcome Materia Medica Farm.

1913 was 0.57. As other investigators have usually recorded about 0.45 per cent. in the wild plant it may be assumed that the plant employed was satisfactory, it therefore follows that the effect of cultivation has been beneficial.

In the following table a number of analyses of belladonna stems and leaves, grown under treatment with various fertilizers on the same plot for four successive years are given:

Fertilizers			Percentage of alkaloid by titration in dry stem and leaf										
					1912. Third year's plants					1913. Fourth year's plants			
Treatment	Time of application	Amount of each application per acre	1910. First year's plants	1911. Second year's plants	June 1st	July 1st	Aug. 1st	Sept. 1st	Oct. 1st	June 1st	July 1st	Aug. 1st	Mean
Main crop	.....	.....	0.61	0.59	0.68	0.59	0.68	0.73	0.44	0.65	0.64	0.62	0.62
Farmyard manure	March	50 loads	0.61	0.53	0.71	0.51	0.54	0.48	0.36	0.58	0.40	0.38	0.51
Sodium nitrate	March, April, May and June	2-cwt.	0.54	0.46	0.64	0.43	0.38	0.53	0.32	0.54	0.52	0.45	0.48
Calcium Cyanamide	May and June	1-cwt.	0.69	0.49	0.75	0.40	0.52	0.46	0.34	0.63	0.44	0.53	0.52
Basic Slag	May and June	2-cwt.	0.65	0.56	0.84	0.51	0.52	0.49	0.39	0.63	0.75	0.42	0.58
Superphosphate	May and June	3-cwt.	0.81	0.49	0.76	0.51	0.52	0.53	0.41	0.63	0.43	0.64	0.57
Kainite	May and June	3-cwt.	0.75	0.53	0.69	0.39	0.57	0.56	0.33	0.57	0.55	0.36	0.53

It will be seen from a consideration of these results that the effect of fertilizers upon the percentage of alkaloid is small, tending to lower it. This tendency, which is most marked in the case of nitrogenous manures, appears to be due to the larger growth which results from such manuring—the larger growth producing more weight of woody fibre. In every case the percentage of alkaloid compares favorably with that contained in wild plants, showing that cultivation is advantageous. As regards the amount of plant harvested a rich nitrogenous fertilizer such as farmyard manure or a mixture of sodium nitrate, basic slag and kainite will increase it several fold if the soil is not already a rich one.

These results indicate that the stage of growth at which the plants are harvested is not important at least as regards alkaloidal content, provided that the plant has not begun to fade when there is a rapid loss of strength, but it appears as is shown below that adverse weather conditions may be the cause of variations.

In the following table the percentages of alkaloid present in the dry stem and leaf are shown in parallel columns with the amount of sunshine and rainfall recorded in London, 16 miles distant from the farm.

Year	Percentage of alkaloid in stem and leaf	Total hours sunshine May 1st to June 30th	Rainfall (Same period)
1905	0.38	387 hours	5.48 inches.
1906	0.54	361 hours	3.86 inches.
1907	0.34	290 hours	3.54 inches.
1909	0.48	387 hours	5.44 inches.
1910	0.61	360 hours	4.08 inches.
1911	0.59	404 hours	3.62 inches.
1912	0.59	360 hours	4.48 inches.
1913	0.65	410 hours	2.20 inches.

It will be seen that the highest percentages of alkaloid were observed in the driest and sunniest seasons while the low percentages found in 1905 and 1907 are explained by the heavy rainfall in the former and the lack of sunshine in the latter season.

Belladonna Roots.

Belladonna root of commerce varies greatly in alkaloidal strength. In a number of analyses made of commercial roots, variations from

0.27 to 0.69 per cent. have occurred. The average of twenty-one analyses of German and Austrian commercial roots was 0.40 per cent.

Other observers have recorded similar results.

Chevalier (*Compt. Rend.*, 1910, 150, 344) gives the following figures for continental roots:

French	0.300–0.450 per cent.
Austrian	0.251–0.372 per cent.
Italian	0.107–0.187 per cent.

Henderson (*Pharm. J.*, 1905, 75, 191) has shown the average of thirty samples for foreign root to be 0.3 per cent.

It is interesting to observe that the average of nine samples of root grown at Dartford is 0.54 per cent.

In order to determine whether this variation was due to collecting at different times of the year, roots from the same plot, derived from second year's plants which had been sown at the same time, were dug up at intervals and dried. The following is a record of the analysis of these samples:

March, 1911	0.56 per cent.
May, 1911	0.59 per cent.
June, 1911	0.53 per cent.
August, 1911	0.50 per cent.
December, 1911	0.59 per cent

The amount of variation throughout the year is thus seen to be very small; there appears, however, to be slightly less alkaloid present during August, when the fruit is ripening. We must therefore seek other explanations for the low percentage of alkaloid present in commercial belladonna root. If one considers the figures recorded by various observers it appears that in the warmest climates, such as those of Italy and Austria, the lowest proportion of alkaloid is to be observed; and this would account for the high reputation of English belladonna. But no such generalization can be regarded as established until plants grown in those countries in a suitable soil and under careful observation have been submitted to analysis. That such an explanation is not improbable is clear from the published facts relating to other alkaloid-producing plants, which show that different amounts of alkaloid are formed in different latitudes. For

instance, Dunstan (*Bull. Imp. Inst.*, 1905, 222) has recorded that *Hyoscyamus muticus* grown in Egypt produces 0.6 to 1.2 per cent. of Hyoscyamine, while the same species grown in India produces only 0.3 to 0.4 per cent. On the other hand, if the harvesting of the crops is done with less care in one country than in another, more decomposition may take place during the process of drying and so cause the observed differences.

In whatever latitude belladonna is grown, it will doubtless be found that the composition of the soil, the use of fertilizers, and seasonal conditions make for small variations.

Wellcome Chemical Works, Dartford, England.

AN INTERNATIONAL PHARMACOPŒIAL BUREAU.[1]

By Professor Joseph P. Remington, Ph.M., F.C.S.

"Peace hath her victories no less renowned than war" is a thought associated in the minds of most Americans when the beautiful city of "The Hague" and her Peace Palace are mentioned, and it is indeed most appropriate that the Eleventh International Pharmaceutical Congress should meet here. Pharmacy is a peaceful art and science, because its votaries in the highest sense are pledged to that glorious work, "the healing of the Nations." But universal peace, at this period of our civilization, is by no means assured, as the terrible sacrifices of the Balkan War are very fresh in our memories. Nevertheless, no one can deny that the great powers of Europe united in an effort, futile though it was, to prevent the awful sacrifices of lives and property. Arbitration as a means of settling national disputes is gaining in strength. War is expensive and it rarely settles anything permanently. Coöperation and amity are now recognized as more effective than a resort to arms, and, if this is true in the affairs of nations, how much more valuable are these attributes in great international movements!

Professor Tschirch has recently contributed to the world a paper on "The Necessity for an International Pharmacopœial Bureau" in which he quotes Professor Ostwald as an advocate of economizing energy in intellectual life and the author presents a convincing argument in favor of establishing such a Bureau.

---

[1] Read at the Eleventh International Pharmaceutical Congress, September, 1913.

Pharmacopœias are primarily authoritative books. An International Pharmacopœia, which would be used in all countries and which would replace National Pharmacopœias, has been for many years one of the grand ideas and principal objects of former international congresses. So many difficulties had to be overcome, however, that at the present time such a hope is not likely to be realized. The idea of having an international agreement on the strength and standards of potent remedies has been in a great measure fulfilled through the actions of the Conference Internationale pour l'Unification de la Formule des Medicaments Heroiques, and thus the greatest need of an International Pharmacopœia has been satisfied.

If an International Pharmacopœial Bureau is established with an efficient laboratory attached, there should go with it a department whose object would be the *detection of adulterations.* This is the crying need of the hour. A numerous band of able chemists are intentionally at work preparing medicaments which are deficient in strength and activity. One of the prime objects of these men is to study the rubrics and standards of the Pharmacopœias which describe tests for identity, purity, and strength with a view of circumventing them. Life itself is a struggle between the powers of good and evil. Banks, corporations, business houses, and firms are employing the highest form of mechanical labor to provide burglar-proof safes in which to lock up valuables; the powers of evil are likewise busy and with greater secrecy and quite as much ability are rendering nugatory the efforts of honest men. No sooner is an invention adopted to provide greater security from theft, than hundreds on the other side are scheming to outwit them; this affects Pharmacopœial Revision work. The Committees must search current literature throughout the world and institute experiments in order that tests may be provided which will detect adulterations and distinguish as readily as possible the differences between the false and the true. Adulteration, sophistication, and falsification have existed from earliest antiquity. *To sell nothing for something and make a good profit* was one of the earliest ideas for amassing wealth. Through long training, the world has been accustomed to regard adulterations with a tolerance which is surprising. One may use a fabric intended to be worn as a part of one's clothing if part of the wool or silk contains cotton or some other fibre which is cheaper; this form of crime is not likely to cause the death of an individual, but calcium sulphate crystallized from a suitable solvent in feathery, acicular crystals as a sub-

stitute for quinine sulphate presents adulteration in one of its worst forms—the cheating of the sick, helpless, and dying.

A large portion of the text of a pharmacopœia consists in providing tests for the exclusion of foreign substances which are intended by manufacturers to reduce the cost of a medicine. If an International Bureau is established, one of the principal objects should be a subdivision or department for publishing to the world all new tests which are proposed from time to time for detecting fraud.

A Department of Pharmacognosy is just as important as a Department of Analytical Chemistry. Drug collectors gather plants which are used to mix with genuine drugs; these are either inert or do not represent the full activity of the drug. Occasionally this admixture may be due to carelessness or ignorance, but far more frequently it is due to intention. If the text referring to official crude drugs is to serve the highest purpose, substances should be described so as to exclude not only foreign admixtures, but the inert portions of that drug, for these would lower the medicinal activity.

In America, owing to the passage of the Food and Drugs Act in 1906, more stringent regulations have been made for the exclusion of drugs in our ports of entry and their quality has been greatly improved. For years it had been the custom of the exporters in foreign countries to regard America as the dumping ground for drugs which were not salable in European marts. This condition no longer exists, although the habit of sending bad drugs to America has not been entirely abandoned, but the penalty of the loss by transportation and the expense caused by reshipment is a great deterrent, and, as time goes on, conditions will be reversed and America will be regarded as the poorest market in the world for inferior or worthless drugs. The microscope and its revelations have been an immediate cause of the improvement in the quality of Pharmacopœial drugs.

These suggestions are intended solely to aid and further the proposition of Professor Tschirch. The Central Bureau should, of course, be established in Europe; the exact locality should depend upon circumstances, of which the writer is not sufficiently informed. These are the days of concentration and centralization; conservation of forces and the necessity for economizing energy in intellectual life should be dominating factors. National pride and jealousy should be eliminated; coöperation should be the watchword. Success will largely depend upon the ability of the Director of such a Bureau.

Not only should he have a comprehensive knowledge of the articles which enter into a pharmacopœia, but he should have the ability to secure results through the employment of able assistants. So many international projects have failed in times past through the enlargement of the scope of the Congress by promoting immaterial side-lines that the original purpose was lost in the distance; but the detection of adulterations and the collection of information about fraud should constitute an important part of the work.

Science has made prodigious strides and specialization is absolutely necessary. It should be the function of the abstractor to collect *known facts* without prejudice. As the learned author says, "The abstractor should not be a critic." He should collect the facts and present them in various languages to the National Pharmacopœial Commissions in each country. Criticisms should be left to the journals, individuals or pharmaceutical bodies where they properly belong.

An international nomenclature has been advocated of late years and it is "a consummation devoutly to be wished." For the accomplishment of this worthy object, the adoption of an international language seems to be necessary. When Esperanto or some other international language comes into general use, the Bureau might sanction an Esperanto equivalent for their medicaments.

More important would be the unification of standards and distinguishing tests for chemical substances. If the various nations of Europe, America, and Asia could establish a minimum standard for purity in chemicals, it would result in great benefit to the whole world. The adoption by the United States Pharmacopœia in 1903 of what has come to be known as the "purity rubric" has been on trial with most satisfactory results for ten years. By this is meant a minimum standard for purity inserted in the text of the official medicament, thus: Potassii Iodidum—"It should contain *not less than* 99 per cent. of pure Potassium Iodide (KI = 166.02)." It will be observed that this does not mean that absolute purity is debarred. A chemical manufacturer may make a product which is purer than the official rubric and may secure more sale for his product by offering a purer article if he wishes to; but he cannot sell for medicinal purposes any chemical which does not reach the minimum standard for purity. Impurity in this case refers to innocuous substances, which, broadly stated, mean traces of other products the presence of which would interfere in no case with the medicinal

activity of the chemical. The tests inserted after the purity rubric limit the presence of more than traces of innocuous impurities. Official quinine sulphate may contain traces of other cinchona alkaloids and Kerner's test with modifications may be used for providing a standard. Everyone knows that the elimination of a minute quantity of other substances or salts will often increase the price of a medicament to an extent far beyond the necessities of the case and absolute purity in every case would saddle an enormous tax upon the buyer and consumer. The tests which eliminate poisonous substances as lead, arsenic, etc., should be rigidly enforced. When the purity rubric was established in the United States Pharmacopœia, there was an outcry from the purists and theorists who proclaimed that nothing but chemically and microscopically pure substances should find their place in the Pharmacopœia. But ten years' experience with the purity rubric has demonstrated its value and a great improvement in the uniformity of chemicals used for medicines has been the practical result.

The formulation of a purity rubric for each chemical medicament would be a most important function for a separate international commission. The Eighth International Congress of Applied Chemistry, at its meeting in 1912, recommended the establishment of standards which would render uniform throughout the world tests for limiting the presence of allowable impurities which are innocuous. Commerce would be benefited greatly and loss occasioned manufacturers through the transportation of medicaments to various countries would be greatly reduced. As it is at present, chemicals which reach the standard adopted by one country would be rejected by another country because of the varying standards of purity existing to-day in their respective pharmacopœias. Is this not a worthy object for an international congress to take up seriously? No country would object to the importation of a chemical which was above the minimum limit and there would be every incentive for a manufacturer to improve his product, but the law would step in and forbid the importation of an inferior product which was below such limit.

THE DETERMINATION OF UNCOMBINED HYDROCHLORIC ACID IN SOLUTION OF FERRIC CHLORIDE.[1]

By C. H. Briggs.

For the preparation of Tincture Ferric Chloride U. S. P. it is essential that the Solution Ferric Chloride used should have the proper degree of acidity. If the Ferric Chloride does not contain enough free acid, the tincture will become cloudy in the course of time and some of the iron will be precipitated.

The United States Pharmacopœia gives a process for the preparation of Solution Ferric Chloride and prescribes the amount of hydrochloric acid which should be added, but it does not give any method for the determination of free acid in the finished product. Hence, in the examination of this solution, it is necessary to depend entirely on the manufacturer for the free acid content, and if the solution has not been properly made, this may be the source of considerable trouble for the consumer.

A search of the literature failed to disclose any simple method for the determination of free hydrochloric acid in solution Ferric Chloride. A direct titration of the free acid with a standard alkali solution and an indicator is impossible because of the weakly basic nature of ferric hydroxide and its failure to react with indicators. However, the amount of iron in the solution is readily determined, so that if the total amount of chlorides in the solution were known, the amount of free or uncombined acid could be calculated. It was found that the total chlorides could be readily determined by titration with N/10 Silver Nitrate, using the U. S. P. method for titrating acid solutions.

The percentage of iron in the solution multiplied by the factor 1.955 will equal the amount of combined hydrochloric acid. This subtracted from the total hydrochloric acid, previously estimated as chlorides, will give the percentage of free hydrochloric acid by weight.

The calculated amount of free hydrochloric acid in Solution Ferric Chloride U. S. P. is 1.25 per cent. A test of one sample which was claimed to be neutral showed 0.18 per cent. free hydro-

[1] Paper presented at the Milwaukee Meeting of the American Chemical Society, March, 1913.

chloric acid, while a sample labeled U. S. P. tested 2.02 per cent. free acid.

It must be noted that the presence of any alkali chlorides or other chlorides in this solution would exclude the use of this method, but these impurities are not apt to be present.

The writer suggests that a test for the amount of free hydrochloric acid in Solution Ferric Chloride be included in the next revision of the United States Pharmacopoeia.

Scientific Department, PARKE, DAVIS & Co.,
Detroit, Mich., March 6th, 1913.

A NEW TEST FOR THE ALKALOIDS OF CINCHONA.

BY G. N. WATSON,
Drug Laboratory, University of Kansas.

An aqueous solution of Quinine Sulphate, when treated with a few drops of a freshly prepared saturated alcoholic solution of Alphanaphthol, to which a few drops of concentrated H_2SO_4 have been added (2 drops per 1 c.c.) produces a yellow precipitate. When the reagent is added in excess, a yellow solution is produced.

Quinidine, Cinchonine and Cinchonidine sulphates, or a solution of their respective alkaloids in dilute H_2SO_4, produce the same color with the Alphanaphthol reagent. So far as the investigation has been carried, no other white alkaloids will give the yellow color.

By means of this reagent the alkaloids of Cinchona have been detected in the presence of several alkaloids, namely, Atropine, Morphine, Cocaine, Strychnine, Caffeine, Brucine, Codeine and Antipyrine.

One c.c. of a solution of Quinine Sulphate (1–2000) was found to produce, with the Alphanaphthol reagent, the characteristic yellow color.

A drop of the reagent, added to the chloroform or ether residues of any of the above cinchona alkaloids produces an intensely yellow color.

SOME "PRESCRIPTION KINKS AND HINTS."[1]

By George M. Beringer, Jr.

The pharmacist might, with profit, stimulate the physicians of his neighborhood to prescribe various coatings for extemporaneously prepared pills. A coating that is easily applied, and, at the same time, is distinctive and unusual, is plumbago. The pills are simply rolled in finely powdered graphite. They may, afterward, be highly polished by rolling on a piece of cotton flannel or of felt.

Physicians are coming more and more to order ointments dispensed in collapsible tubes. The usual methods of filling the tubes are by means of a spatula or by melting and pouring the ointment into the tube before the ointment has quite solidified. The first of these is rather troublesome and "messy." The second cannot be used in very many cases without having an uneven admixture of the ingredients and an ointment far from smooth. The following has been found a convenient, clean and rapid method: The prepared ointment is placed in a thin streak along the center of a piece of suitable paper (preferably parchmentized) about 1¼ times the length of the tube to be filled and about 3 or 4 times the diameter of the tube, in such a manner that the paper and ointment may be rolled into a pipe of slightly smaller diameter than the tube. This pipe is inserted into the tube and the outer end of the paper folded over. The folding-over is continued and the paper withdrawn as the ointment is expressed into the tube. In this way the tube is filled as solidly as by a machine and with little or no loss or smearing.

It has been found difficult to powder chloretone finely enough to make a smooth ointment. It becomes so electrified upon trituration that it sticks to mortars, pestles and spatulas and, when scraped off, flies in every direction excepting the one intended. As it was prescribed in an ointment, for rectal injection, it was not thought advisable to use alcohol or similar solvents to facilitate its incorporation. The substance can, however, be made into a very smooth paste by rubbing upon a tile with a few drops of expressed oil of almond, before incorporating with the other ingredients.

[1] Read at the annual meeting of the New Jersey Pharmaceutical Association, June, 1913.

Scarlet Red ointment is frequently prescribed in such a manner as to leave the selection of the base for its incorporation to the judgment of the dispenser. Petrolatum is the base most frequently used. The dye, however, is *nearly insoluble* in this medium. It would seem reasonable to suppose that particles of a substance coated with another substance in which they were insoluble would have little or no action upon the tissues with which they were brought in contact. The dye *is* soluble in benzoinated lard and the ointment so made is certainly smoother and probably more efficient.

A prescription was received for soft elastic capsules of oil of erigeron, each containing 3 or 4 drops. It was necessary to add some fixed oil as a diluent in order to fill the capsules satisfactorily. Olive oil, the usual diluent in such cases, formed a cloudy mixture, and, with an old sample of erigeron oil, even threw out resinous masses. Expressed almond oil did the same. Castor oil made a very clear and brilliant solution and was used with satisfaction.

The following prescription for an injection seems simple, but illustrates how a very slight difference in manipulation may make considerable improvement in the finished product.

℞

Tr. Opii	fl. dr. 1.
Tr. Catechu Co.	fl. dr. 2.
Plumbi Acetatis	gr. 15.
Zinci Sulphatis	gr. 15.
Aquæ Rosæ qs. ad	fl. oz. 8.

M

This was at first prepared by adding the Tr. Opium and the Comp. Tr. Catechu to the other ingredients—previously mixed "secundum artem." It was found, however, that the precipitate subsided very rapidly and, with some specimens of Comp. Tr. Catechu, was granular. The following method proved better: The Tr. Opium and the Comp. Tr. Catechu were mixed with 4 fl. ozs. of the Rose water, the other ingredients mixed secundum artem with the balance of the Rose water and the two solutions mixed. By the latter method the ppt. was more bulky and more finely divided, hence, subsided more slowly and could be more evenly administered.

The well trained pharmacist is exceedingly careful, when triturating two powders, to add very slowly and cautiously the diluent powder to the more active; yet, very often, the same person fails to realize the importance of observing the same procedure when triturating an insoluble powder with a liquid. Two samples of the following prescription illustrate the importance of this:

℞

Calaminæ	gr. 40.
Zinci Oxidi	dr. 2.
Liquor Calcis .....fl.	oz. 4.

M

A sample, prepared by adding the lime water in considerable quantities at the start, although triturated for a fairly long time, commenced to subside immediately after being shaken up. Coarse particles could be readily seen in the mixture.

A second sample, prepared by adding the lime water in small amounts and triturating after each addition till a perfect magma was formed, had scarcely commenced to precipitate five minutes after being shaken. The particles were apparently evenly divided, and after final separation, on long standing, the precipitate was twice as bulky as that in the first specimen. It is easy to imagine which sample could be most evenly applied and would give the most benefit when applied to the skin.

The following formula presents a unique difficulty:

℞

Kaolini	oz. 4.
Glycerini .....fl.	oz. 1.
Sod Salicylatis	dr. 2.
Ol. Eucalypti .....fl.	dr. 4.
Ac. Borici	gr. 50.
Ol. Gaultheriæ .....fl.	dr. 2.
Mentholis	gr. 40.
Lanolini	oz. 2.

M

This was prepared by rubbing the Kaolin, Boric Acid, Sodium Salicylate and Lanolin together in a mortar, incorporating the Oils in which the Menthol had been dissolved, and, finally, adding the Glycerin. The result was a granular mass mixed with what appeared to be streaks of oil. However, the oils had been per-

fectly incorporated before the Glycerin had been added; also, previous experience had taught that alcohol and some other liquids would not mix with Lanolin until diluted with sufficient Water. Hence, a fl. ounce of Water was added and well stirred in, when the mass became a perfectly smooth cataplasm.

THE PHENOMENA OF CATALYSIS.[1]

Remarkable Results Produced in Chemical Reactions by the Mere Presence of Certain Substances Which Undergo No Permanent Change.

By W. R. Whitney.

This is a purely chemical term and stands for the process of greatly increasing the velocity of chemical reactions by employment of materials which are not consumed in the process. Any analogy is apt to be misleading, but Ostwald suggests the parallelism between catalysis in chemistry and the effect in mechanics of the change from a too thick to a good lubricating oil on a shaft rotating under constant force. The speed will increase without application of additional energy. In a sense, this definition is too academic. In most of the processes called catalytic, the velocity-increase is so enormous that, without the catalyzing agent, the process would hardly take place at all. For this reason a catalyst is sometimes defined as any substance which *produces* a chemical action without being consumed in the process.

Catalysis is usually limited to describe cases where a definite material, or even a definite form of material, seems to bring about a reaction or produces a great increase in the velocity of the reaction. Heating the reagents produces great increase in velocity of most chemical reactions, and some are made to speed up by the effect of light, and so heat and light are sometimes called catalyzers. But it is customary to consider this type as at least partially understood and to class under catalysis the less easily explained cases, where the mere presence of some *material* apparently does the work and is yet not consumed. It acts more like the trigger of a gun. This sets off the reaction, which in our gunpowder analogy

[1] Reprinted from *Sciences Conspectus*, 3, 1913, pp. 84–88.

would otherwise be an exceedingly slow oxidation. The gunpowder might take a century to oxidize unless it were set off, although the products of the reaction would be the same regardless of the velocity.

It is very probable that for years catalysis was a word used, as such terms are often used, to classify or group together, without further commitment, a number of different phenomena which were not at the time explicable. It was known that hydrogen and oxygen could be mixed and would remain inert indefinitely, but that a little platinum or an electric spark in the presence of the mixture would cause rapid combination to form water. A finite quantity of platinum was able to produce the reaction between an unlimited quantity of these gases. Other finely divided metals acted similarly. The platinum was called the catalyzer. The spark in such a case was not usually considered as a catalyzer in the narrower sense. This is probably because the case is an application of intense heat which in any other manifestation is equally efficacious. It has been the custom to consider as cases of catalysis only those reactions in which the phenomenon can be ascribed to some material, thus excluding greatly increased reaction velocity due to light, high temperature, etc. It was known, on the other hand, that the decomposition of hydrogen-peroxide solution was greatly hastened or made almost instantaneous by colloidal platinum and other colloidal metals. Here again the metal was not consumed and had not lost any of its power after it had apparently accomplished so much. It was known that sugar in aqueous solution is ordinarily decomposed by the water into dextrose and lævulose with exceedingly low velocity, but the same reaction takes place very rapidly in presence of acids or certain organic ferments. Thus the acid and the ferment were called the catalyzer.

It is known that many of our most common chemical reactions owe their velocity to the presence of water. In fact, water is the most common and most important catalyzer of all. It is much easier to find cases of chemical reactions which need water for any appreciable velocity, than it is to find reactions which can proceed in its absence. Yet in most of them the water apparently does not take part in the reaction nor is lost through it, and the same water could be used to an unlimited extent. Practically all of the common chemical reactions are of this type. Silver nitrate and sodium chloride do not react in the dry state, and the mere condition

of solution is also not a criterion. While these two react readily when dissolved in water, they need not react appreciably when dissolved in some other solvent. This catalytic action of water, so common as to be usually lost sight of as a case of catalysis, is a very marked case because of its sensitiveness. The most refined methods have had to be employed to remove the water in cases where its effect was to be studied. For example, the ordinary explosion of carbon monoxide (CO) with oxygen does not take place if the gases are perfectly dried, but a trace of moisture makes it easy to start the reaction by a spark. Such active agents as gaseous hydrochloric acid and ammonia, which combine readily at ordinary temperatures, do not react in entire absence of water. And the decomposition or dissociation of ammonium chloride which in any ordinary experiment is readily brought about by moderate heating, will not occur in absence of traces of moisture.

The method of action may not be the same in these various cases, but the resulting great increase in velocity of action or even apparent production of the possibility of reaction and the non-consumption of the foreign matter or catalyst is common to them all. There are many other such reactions.

The various types of catalysis apparently differ widely, and while they possess in common the peculiarity which coördinated them under this head, they are being subdivided and grouped under new classifications because differentiating characteristics become gradually better understood. For example: there is a large group of chemical processes which are catalyzed by the presence of solids; sometimes by a specific solid, such as platinum, in other cases by a particular state or property of a solid, such as fine subdivision or large surface area, etc. A little palladium or osmium will ignite illuminating gas at the burner-tip in air. Some platinum, vanadium oxide, or even iron oxide will bring about the rapid union of sulphur dioxide and oxygen. These may be classed as surface effects, as absorption effects, etc., while it is not probable that reactions which owe their procedure to liquid or gaseous water can be so classed.

A number of catalyses may be looked upon as being due to the formation, for a short time, of products containing the catalyzer and one or both of the reacting substances, the catalyzer later stepping out of the reaction at its completion, much as the marrying parson leaves the wedding ceremony with his marrying power un-

diminished. In such cases it seems necessary to grant that the time necessary for the catalyst to unite with one of the reagents, and for the second to enter the reaction and the catalyst to back out, so to speak, is in all shorter than the time necessary for direct union of the reacting substances. This is possible. The catalyst often seems to be merely a means of in some way reducing the delays in a process. It can hardly be said to reduce the resistance to reaction, for reduction of resistance should cause a change in the total heat evolved by the reaction, and this does not occur.

Any treatment of this subject would be incomplete which did not mention the phenomenon of anti-catalysis or negative catalysis. As the name implies, this is the case where the presence of some otherwise inactive substance retards or prevents a reaction which would otherwise take place. In biological chemistry there are many such cases, and they are frequently referred to as poisonings. One of the best known inorganic cases is that described by Bredig, who found that while the decomposition of hydrogen peroxide was catalyzed by colloidal platinum, iridium, etc., the presence of almost any one of the common soluble poisons was capable of destroying the action of the catalyst and of preventing the reaction. Hydrocyanic acid, hydrogen sulphide, arsenic, copper salts, etc., are such poisons. These poisons also act as anti-catalyzers to a number of biochemical reactions, ferment actions, etc. Water in most cases is an active catalyzer, but a few cases have been found where it is distinctly an anti-catalyst. Oxalic acid, dissolved in dry sulphuric acid, decomposes very rapidly, but the presence of traces of water greatly diminishes the velocity. The hydrogen ion is a generally active catalyzer. It shows its power in many cases of hydrolysis and in the action of enzymes, etc. The hydrolysis of cane sugar by acids depends upon it.

A multitude of reactions for which solid catalyzers have been found may be represented by one or two specific cases. Ammonia and alcohol vapors combine rapidly in the presence of heated thorium oxide, so also do phenols and alcohols. Titanium oxide and other metal oxides catalyze organic reactions without there appearing to be any predeterminable predilection. One is led to imagine that every possible chemical reaction has its specific catalyzers. Haber has said that every solid substance exerts some accelerating action on gaseous reactions, though some do it much more markedly than others.

It may be that all cases of catalysis are to be looked at as brought about either by the formation of intermediate chemical compounds of the catalyzer with one or both of the reagents and the subsequent breaking down of such compounds to the final reaction products, or of physical adsorptions corresponding to the increasing of concentration of one or more of the reacting substances.

The chemical industries are full of the most interesting and successful catalyses. Sulphuric acid manufacture has always made use of catalyzers in some form. In the early days it was the nitrogen oxides, and now it is platinum sponge, etc. When sulphur is burned in air, or oxygen, the dioxide is produced, and this, even in the presence of excess of oxygen, does not seem inclined to continue in the process of oxidation to the state of trioxide at any measurable rate. Yet this is the direction it should proceed, and any one of several triggers or catalyzers will effect it. It is very important to note that the final state of all of these catalyzed reactions is the "natural" state; that is, no consumption of energy is needed to reach the state, and energy is evolved by the process. The sulphur, in burning, *tends* to become the trioxide. Under normal conditions it only reaches the dioxide state in measurable time, but contact with such a solid as platinum sponge will catalyze the reaction, thus producing with great rapidity sulphur trioxide (the anhydride of sulphuric acid).

The great German dye firm, the Badische Analin u. Soda Fabrik, made careful study of catalyzers for the reaction between hydrogen and nitrogen by which they hoped to and finally did make ammonia commercially. The reaction was a perfectly possible one, but without catalysis it was always too slow to be practical. Finely divided iron, manganese, molybdenum, and tungsten were all found to be effective, and it was further found that these catalyzers could easily be poisoned by some reagents, but could be benefited by others. Thus arose the term "promoters" in catalyzers. A small quantity of some substance, such as an oxide, for example, serves as a promoter to the catalytic action of iron on the ammonia synthesis. Thus a practical and commercial process for direct synthesis of ammonia has been brought about. This reminds one somewhat of the complements and the immune bodies which, while cooperating in the blood, produce the effects of immunity.

There seems to me to be one simple way of looking at all catalyzers which is useful if it be not used unfairly. The velocity of

reactions depends on the concentration of the reacting particles (molecules or ions, or whatever they may be). It is not difficult to find in all cases of catalysis the probability of an increased concentration which is attributable to the catalyst. This is plain in such a case as platinum sponge and surface or solid catalyzers, for the absorption and adsorption of gases in such cases are well known. It is only a step along the path of this illustration to see possible intermediate physical and chemical compounds as concentrations of one or both of the reagents. Solid thoria catalyzes many organic reactions, so also does dissolved aluminum chloride. In the former case the physicist would grant the formation of adsorption compounds, and in the latter case the chemist recognizes the temporary formation of intermediate chemical addition products with the aluminum chloride. If we look at these two cases as cases of increased concentration of the reacting reagents, the possibility of coördination is clear.

The reactions in living matter (plant and animal) are very commonly catalyzed. Many of the catalysts have been named and have been isolated in more or less pure form. Malt diastase, which brings about the dissolving or hydrolyzing of starch, is such a catalyst. By its action in the germinating grain or seed, the reaction of the break-down, dissolution or solution of the starch is made rapid. The starch would be useless without this catalyst, and it is not used up by the reaction. This process is not confined to the cell or seed. It may be carried out in the laboratory. For example, a large mass of nearly solid starch paste may be made to rapidly liquefy by the introduction of a very small quantity of diastase. The enzymes ptyalin, invertin, emulsion, pancreatin, pepsin, and a score of others, are quite analogous. They each catalyze some reaction characteristic of some living process. Albumen and similar albumenoid matter is rendered soluble or assimilable by the catalytic action of pepsin, for example. The reaction is not a simple one between the pepsin and the albumen, but the latter causes the albumen to react with the water present and hydration occurs. A perfect explanation of this catalysis in life-reactions is probably not yet possible, but in looking for analogies of our apparently simpler cases, we are struck with the force of the fact that these digesting catalysts are known to absorb on, or absorb in the organic matter whose dissolution they catalyze. For example: if fibrin be suspended in gastric juice (which contains some of these organic

catalyzers or enzymes), it can be shown that they leave the solution and are absorbed by the fibrin in which they are producing the decomposing reaction. They thus resemble the reacting gases which adsorb in the platinum of our simpler cases.

An exceedingly interesting recently investigated case of catalysis in the relatively simple reactions of the laboratory, corresponds so perfectly to a well known and apparently complex historical case in Nature that I make bold to present it.

It may be recalled that in that remarkable biochemical work of Pasteur's in connection with a study of the tartrates, he found that in the crystallized tartaric acids there were left and right crystals, shapes which corresponded as our left and right hands do and would not permit of even imaginary superposition. So also, when these were in separate solutions, one caused rotation of the plane of polarized light to the right, and the other to the left. When they are suitably mixed they form the optically inactive racemic acid. One of the ways, which he discovered for separation of these two forms when found thus mixed in Nature, was by means of the green mould *Pencillium glaucum*. The growth of this mould caused decomposition or destruction or oxidation of one of these exceedingly similar chemical compounds (identical in quantitative chemical composition) more rapidly than the other; it showed such a selective catalysis as to distinguish between the two. This was a case of selective catalysis by the enzyme or ferment of the growing mould. Starting with the racemic, or optically inactive acid, he could stop the fermentation at a stage where only the lævo tartaric acid remained, the dextro tartaric acid having been destroyed.

Now quite recently, Bredig and his pupils have studied the reaction of decomposition of bromcamphorcarbonic acid when catalyzed by small quantities of organic bases such as the alkaloids. They seem to have thus produced results very perfectly paralleling the above historic discoveries of Pasteur.

The molecular structure of the tartaric acids is such that, knowing this structure and knowing that an asymmetric carbon atom will produce optical activity, it is now possible to predict such developments as the separation of some optically inactive material into two optically active ones. It was shown that in the decomposition of bromcamphorcarbonic acid, the organic alkalies act as catalyzers. This substance decomposes slowly into bromcamphor and carbonic

acid. The process is catalyzed by organic alkaline bases, such as analin. The bromcamphorcarbonic acid has two optically active forms corresponding to the left and right tartaric acids of Pasteur. Both of them are catalyzed equally by optically inactive bases, but one of them is more rapidly catalyzed than the other by chinin as catalyzer, and the other is more rapidly catalyzed by chinidin than the one. Chinin and chinidin are themselves optically active substances, and thus it is found that an optically active catalyzer is capable of differentiating in catalysis between two optically active compounds and can catalyze the decomposition of one of them more than that of the other in a mixture of both, as Pasteur found with *Pencillium glaucum* and the tartaric acids.

HOW TO STUDY MEDICINE.[1]

By Henry S. Pritchett,
President of the Carnegie Foundation.

To-day there are some hundreds of thousands of young men and youths in our country who are thinking more or less seriously of adopting some profession, and many thousands of these are looking toward the profession of medicine or surgery. Hundreds of others will be attracted toward that profession by the advertisements of medical schools, for medical advertising is a business in our country. A large number of young men who are clerks in country stores or assistants in railway offices have been led to undertake the study and practice of medicine as a result of the alluring inducements held out by these advertisements, inducements which paint the life of the physician and surgeon in glowing colors and the receipts from professional fees in the most optimistic vein.

The spectacle which this presents—that is to say, the spectacle of men being led into a profession so serious and important as that of the physician and surgeon by the mere influence of an advertisement—is something which one cannot see in any other country. It exists in the United States because of the excessive number of medical schools in this country and the resulting competition for students. There are nearly as many medical schools in the United States as in all of the rest of the civilized world put together. These

[1] Reprinted from *The Outlook*, Oct. 1, 1910, pp. 272–275.

medical schools in some instances are splendid institutions abreast of the science and the practice of the day, such as those of the Johns Hopkins University, of Harvard, and of Ann Arbor. But the majority are proprietary schools—that is to say, schools which are owned by an individual or by a group of individuals, and which depend for their continued existence upon securing a considerable number of students. This solicitation is made in most cases through advertisements which are intended to catch the eye of the boy or the young man who is tired of his present job and is anxious to find another.

The consequences of this overmultiplication of medical schools striving to get students has resulted in a great overproduction of physicians and surgeons. There are more physicians to-day in the United States to each ten thousand inhabitants than in any other country in the world; and, unfortunately, the vast majority of these men have had no adequate preparation in their profession, and a very large proportion of them have gone into it with little conception of its obligations and its demands. As a result, the living which the average doctor is able to make is a meagre one, and in the little towns of two or three thousand inhabitants, where ordinarily one finds from five to ten physicians, the practitioner can expect only a bare living. The situation is one calling so strongly for improvement, and one in which the youth who goes into the profession is so often the victim of false representations, that I venture to state a few of the preliminary facts which the young man who is looking toward medicine ought to take into account.

First of all, no young man who is thinking of the profession of medicine should allow himself to be influenced by the commercial argument. Medicine is a profession, not a business, and the man who goes into it, whether he gain a large practice or a small one, must give out much more than he receives, not necessarily in money, but in effort and sympathy and sacrifice. The man who is seeking a business which will bring him money should look elsewhere.

Second, no man, whether young or of more mature age, should choose a school in which to study medicine through an advertisement. You may be sure that the institution which seeks to secure your attendance as a student through alluring advertisements is in every case a bad place for study, and that the very fact of these specious advertisements is a proof of its weakness and incompetency. If you have decided to study medicine, find out from the best-informed

physicians of your neighborhood where medicine may be rightly studied, but do not make, in any case, your decision from the advertisements or the solicitations of the medical schools themselves.

Furthermore, the boy of this generation who looks toward medicine must understand that medicine has almost been made over in the last twenty years. To-day the practice of medicine rests upon the application of certain fundamental sciences, many of which have had their development in these last two decades. For example, physiological chemistry, the chemistry which undertakes to deal with the processes of digestion and of assimilation, was hardly known as a practical science twenty years ago, but to-day it is playing a most important rôle in the equipment of the rightly trained physician. The men who graduated twenty-five years ago from the medical school had never made a culture of bacteria. To-day no man can practice medicine without day-by-day examinations of the by-products of the human body. In a word, the medical and surgical practice of our day is nothing other than the application of those fundamental sciences—physiology, anatomy, bacteriology, physiological chemistry, and the like—which deal with the functions and the construction of the human mechanism. Therefore, any man who is to practice medicine in the future must have a grounding in these sciences, and a thorough one.

All this has brought it about that the physician of this generation must be not only grounded in the technique of these fundamental sciences, but he must be an educated man as well. If you are clerking in a store, or keeping books in a railway office, or traveling for some commercial house, and have come, through one means or another, to consider medicine as a calling, don't imagine for a moment that you can be a successful and rightly fitted practitioner of medicine without a good general education, and, if you are in earnest about your profession, you will go to work to get this general education first before undertaking the other. The day of the uneducated doctor is past, except as he is able to impose his practice upon people who do not know what they are entitled to have in the way of medical treatment.

Above all, do not let yourselves be misled or deceived by the plea put forward by the commercial medical schools, that they are to serve the poor boy. This assumes that the poor boy is in some way or other to be got into the practice of medicine without complying with the requirements for that profession which other boys are

to submit to. On the face of it, this is a concession to the poor boy. As a matter of fact, it is not only an insult to his intelligence, but its real purpose is to serve the weak and ill-prepared medical schools which can live only by drawing to their doors a mass of uneducated and unfit men, the great majority of whom are turned out from these low-standard institutions at the end of one or two years. The fact is that a poor boy has no right to go into the practice of medicine with any lower qualification than the rich boy. The practice of medicine is one of the great human professions which affect profoundly not only the health but the moral and social lives of a community. No man has a right to go into it unless he will fit himself fairly for the work. Educational opportunities in America are to-day so generous that any poor boy with the right stuff in him who desires to enter medicine can secure, not only the necessary medical education, but the requisite general education. It is only a question of his persistence and his courage and his energy; and the young man who allows himself to be persuaded into the profession by the advertisement of some school which offers to provide a short cut for the poor boy may feel sure that in the end he will find himself in a profession in which he will be utterly outclassed and in which he can obtain only such practice as may not be desired by the competent practitioner.

To-day the medical colleges of the country are graduating many more physicians than can possibly find places for a fair practice. Little towns which could support in comfort two competent practitioners are called upon to support half a dozen, and this means usually a half-dozen incompetent men. The boy who is looking toward medicine may well take these facts into account, and fairly face the further fact that, unless he has a good education and unless he will go to a well-equipped medical school, he can have no real opportunity for a useful and satisfactory life in this profession in the future. As to which medical schools are prepared to teach medicine in the modern way, the medical student who is in earnest can learn from any well-informed practitioner in his own neighborhood. Only let him be sure to get his advice from some man who knows the medical teaching of the last two decades, not from one who makes his recommendations from his recollections of the didactic medical teaching of twenty-five years ago.

There is one other word which the man who has to do with education—and this is quite as much a question of education as it is

of medical practice—feels he must say to the future practitioner, and that is a word concerning the matter of medical sects. It is a very common thing to find the young candidate for medicine more concerned over the question whether he shall be allopath, homeopath, eclectic, or osteopath than to find him seriously inquiring as to the nature of the instruction he is to seek. This is partly due to lack of information concerning the modern training in medicine, and partly to the fact that a large number of men are entering the profession from the standpoint of a commercial, not from the standpoint of a professional, career, whose chief attraction to the true physician lies in the opportunity to serve humanity.

Now, the question of medical sects is a difficult one to deal with, even for an outsider, and I do not intend for a moment to urge one or the other of these sects upon the consideration of any young man. I wish only to call his attention to this fundamental consideration which he generally loses sight of. Whether a man call himself an allopath, a homeopath, an osteopath, or an eclectic, he is going to be called upon to diagnose and treat the same diseases. In a little Western town a hundred miles from a railway I have seen a man who had spent two short winters in an osteopathic establishment undertake to diagnose appendicitis, rheumatism, adenoids, various diseases of children and of adults, and to treat them all by one mechanical process. In other words, whether a man calls himself by one name or another, he must know those fundamental sciences upon which medicine rests, and these are just as necessary for one medical sect as for another. The man who thinks that he can prepare himself for a rapid medical practice by joining one sect rather than another is not only getting ready for a bitter disappointment, but he is getting ready also to do the gravest kind of injustice to the people upon whom he seeks to practice, since he undertakes to deal with the very questions of life and death without having prepared himself in any fair way to know what those issues are or how to deal with them. Whether you undertake to be one thing or another, do not for a moment forget that this fundamental study and preparation is absolutely necessary if you are to be an honest man as well as a practicing physician.

I venture, therefore, to urge every young man who has in mind the practice of the noble profession of medicine to face the requisites of that profession before he embarks on it, to get a fair general education before he begins his professional education, and to under-

stand clearly that he cannot get a modern medical education in a proprietary, advertising medical school which lives on the fees of its students, even if that school finds shelter under the charter of a well-known college or university.

THE GEOGRAPHIC DISTRIBUTION OF TANNIN PLANTS.[1]

By W. W. Stockberger,[2]

Bureau of Plant Industry, U. S. Dept. of Agriculture.

The constant increase in the quantity of tanning materials which is being imported into the United States cannot fail to arouse further interest in the source of these products and in the economic conditions prevailing in the countries from which they are derived. Since in recent years important additions have been made to the number of plants recognized as available sources of tannin, further knowledge regarding their abundance and general region of occurrence is naturally very desirable. Also much more definite information is needed concerning the local distribution and commercial range of all important tannin plants before either their economic significance or their practical importance as an available source of tannin for trade uses can be fully determined.

The limits of this brief and general paper will permit the mention of only a few of the salient features of the distribution of tannin plants, with very little discussion of this subject in its practical aspects, although the latter are yearly growing in importance. The significance of certain facts respecting the geographical distribution of tannin plants can perhaps be more fully appreciated if some consideration is first given to the distribution of tannin in the various natural orders and families into which plants have been grouped with respect to their relationships. This is a subject which has received very little attention except for the contribution of Dr. Dekker[3] in his invaluable monograph on the tannins, which has been freely drawn upon in the preparation of this paper. In Dr. Dekker's work

[1] Reprinted from Journal of American Leather Chemists Association, January, 1913.

[2] Read at the A. L. C. A. Convention, Washington, Dec. 5, 1912.

[3] Dekker, J., "De looistoffen," Bulletin van het Koloniaal Museum te Haarlem, No. 35, 1906.

the results of his own extensive researches are so combined with those recorded in the widely distributed literature of the tannins that the whole presents a mass of data from which important generalizations may be made. However, since the number of plants in which the presence or absence of tannin has been determined is relatively small in comparison with the number of known species of plants, it is very probable that these generalizations will be more or less modified by future investigations.

When the groups or subdivisions into which botanists divide the plant kingdom are considered with respect to the occurrence of tannin therein it appears that some forms of this compound appear in all of the main groups of plants, but that in every group there are many families that contain little or no tannin. In the lower groups of plants represented by the algæ, fungi and lichens, tannin is of frequent occurrence but owing to the relatively small mass of plant material furnished by these groups the total quantity of tannin produced is not sufficient to have any commercial importance. In the next group, the mosses, very few plants have been found which give a positive reaction for tannin. The group which includes the ferns has numerous species which vary in tannin content from a mere trace to as much as 10 per cent., but it is in the higher group of seed-plants that tannin occurs most abundantly.

The subdivision of seed-plants, known as the Gymnosperms, contains a large number of plants which have a high tannin content. The most important of these are species of trees such as the pine, hemlock, spruce and fir. On the other hand among the Monocotyledons the number of families in which tannin has been found is small, and of these the Palmæ is the only one in which there are plants which furnish tannin in commercial quantity. Among the hundreds of species of the families which include the grasses, sedges and lilies, the occurrence of tannin even in very small quantities is quite rare.

The last and most important division of the seed-plants, the Dicotyledons, furnish by far the largest number of plants rich in tannin. The respective natural orders comprising the Dicotyledons vary greatly, as has been pointed out by Dr. Dekker, in respect to the manner in which tannin is distributed among the various families. In every order it frequently occurs that of two closely related families the plants of one will be rich in tannin while in the plants of the other, tannin will occur either in very small quantities or not at all.

Occasionally there seems to be a gradual variation in tannin content between closely related families. Some natural orders contain no families of plants at present known to produce tannin, and in other orders almost the entire range of families furnish plants containing tannin but in very limited quantities. From the information which is at present available it does not seem possible to establish any very direct correlation between the production of tannin by different families of plants and their relationship to any of the schemes of classification which are in use by modern botanists. Since, however, most of the known facts concerning the distribution and abundance of plants have been collected and arranged with reference to the botanical classification it will be desirable to recognize the usual divisions into orders and families for the purpose of more clearly setting forth the general facts concerning the geographical distribution of plants producing tannin.

Turning now to the actual question of geographical distribution of plants producing tannin, we may at once dismiss from consideration all of those families in the previously mentioned classification other than the seed-plants. We will consider for convenience of discussion each of the three main groups of seed-plants, beginning with the Gymnosperms. In this subdivision practically all of the plants known to contain tannin occur in one of four natural orders, the chief of which is the Pinaceæ, to which belong the pines, spruces, hemlocks and firs. The distribution of this group in the northern hemisphere naturally follows closely that of the coniferous forests and aside from the occurrence of a species of *Podocarpus,* in Southern Africa, and a species of *Phyllocladus* in Tasmania and New Zealand, there are no important tannin-bearing representatives of the Gymnosperms to be found south of the Equator. The distribution in the Northern Hemisphere coincides in a more or less general way with the principal mountain ranges, the slopes of which are naturally wooded with forests of coniferous trees. This of course tells nothing of the distribution in detail but merely indicates the densest areas on which plants of this group, having a high tannin content, may be found. Scattered generally throughout certain sections of the United States and Mexico, as well as through regions in Central and Northern Europe and Asia, are many tannin-bearing species which belong to this group, but since by far the largest number of important species are included among either the pines, hemlocks or spruces, it follows that the general distribution of this group of tannin plants conforms

quite closely to that of these species of trees. So far as known it appears that the tannin-bearing Gymnosperms are practically confined to the north temperate zone, and because of their accessibility and the inroads made upon them in order to meet the increasing demands for timber it is probable that this source of tannin will be one of the first to be exhausted.

The second group of seed-plants, the Monocotyledons, is quite unimportant from the standpoint of tannin, although it contains many hundreds of species of plants which are well known and widely distributed. Here, as was stated, belong the grasses, of which there are more than 3,500 varieties, but only four or five of these are known to contain tannin. In the one order which contains all of the tannin plants of importance, two only are worthy of mention here. These are the palmetto of Florida and *Areca Catechu* of India, which is one of the commercial sources of cutch. There are 35 other orders in this group, the plants of which are widely distributed, but they are so poor in tannin that from the commercial standpoint at least they cannot be regarded strictly as tannin plants.

The third group of seed-plants, the Dicotyledons, contains by far the greater number of tannin plants. In some of the natural orders of this division tannin producing families are practically wanting, in some the relative number of tannin families is variable, and in others practically every family contains tannin producing plants. A study of those natural orders in which only a part of the families contain plants rich in tannin reveals some interesting facts. Several of these orders are widely distributed both with respect to climatic conditions and continental location. Representative species which contain tannin occur in various situations ranging from the tropics to areas approaching the limits of vegetation toward the poles. However, when the locality is considered, of such plants as have been found to yield tannin in percentages sufficient to make them commercially promising, it becomes evident that with few exceptions they are all to be found in tropical countries. This fact may be concretely illustrated by citing the distribution of some of the more important tannin plants belonging to those natural orders in which there is great variation between families with respect to tannin production. For example, the natural order Urticales has three tannin producing families comprising about sixty species of plants of which those highest in tannin, 4 to 14 per cent., are a few species of *Ficus* growing in India and the Philippines. In the

order Santalales four families together contain about fifteen species of plants which produce tannin, the important ones being species of *Osyris* and *Fusanus* from India, Central Africa and Australia, ranging from 15 to 25 per cent. in tannin content. The order Ranales has nine families which together include a hundred species of plants containing more or less tannin; of these the best known are species of *Persea* in Chili, 17 per cent. tannin; *Nectandra* in Brazil, 10 per cent. tannin; *Nesodaphne* in Australia and *Litsea* in India, both yielding over 7 per cent. tannin. In the order Tubifloræ a large number of tannin containing species is distributed among fourteen families. The important tannin plants are species of *Bignonia* from Guiana, 14 per cent. tannin, of *Eremophila* from Australia and of *Avicennia* from the East and the West Indies. Other orders in which a part of the families have numerous species containing tannin, the important ones of which are largely confined to the tropics, are the Contortæ, Aristolochiales, Rubiales, Umbelliflora, Parietales and Malvales.

No less interesting is the distribution of those orders in which practically all the families comprise tannin bearing plants. In some of these families the occurrence of tannin is so general that they may be considered as typical tannin families. Examples of such are the Combretaceæ, consisting of about 240 tropical species, one of which yields the myrobalans of commerce; the Rhizophoraceæ which contains about 50 tropical species rich in tannin, some of which yield the mangrove bark; the Leguminosæ with about 6,000 widely distributed species of which many of those rich in tannin, as the wattle, algarobilla, ratanhia, kino and divi-divi, are tropical, and the Myrtaceæ which has at least 100 tannin species, the best known of which is the Eucalyptus, native of Australia. Notwithstanding the wide distribution of these families, by far the greater number of species having a high tannin content occur in tropical or subtropical regions. There are, of course, some exceptions, as, for example, the Fagaceæ, to which the oaks and chestnuts belong, but in general that portion of the several continents lying between the parallels of 30° north and south latitude must be depended upon to furnish the bulk of the supply of commercial tannin.

An enumeration of the various plants which have been used for tanning in different countries would give only an apparent indication of their geographic distribution, since a tannin plant frequently occurs in countries where it finds little if any use and perhaps more

frequently its greatest use is in countries where it does not naturally occur. In many cases it is equally unsafe to judge of the botanical distribution of these plants from the localities given as the source of the material used in the analyses reported in the literature of the tannins. The writer recently examined what purported to be a list of the most important tannin plants of the world in which the country where each species occurred was given. On tabulating this list the following distribution of the species was obtained:

India	68 species	Chili	3 species
Europe	40 species	Brazil	3 species
Australia	22 species	Argentine	3 species
North America	16 species	New Zealand	3 species
Africa	9 species	Peru	2 species
Central America	7 species	Guiana	2 species
China	3 species	Asia	2 species
Japan	3 species	Mexico	1 species

A number of reasons might be given for the apparent inequality in distribution shown by this compilation, but it will suffice to say that botanical exploration, particularly with respect to economic plants, has been carried much further in India and Australia than in other tropical countries, and that when these countries shall have been fully explored substantial additions will probably be made to their lists of tannin plants. In this connection mention may be made of a note by the writer in the JOURNAL of this Association [4] in which attention is called to thirty-five species of tannin plants in Paraguay, only one of which is referred to Paraguay in most of the literature on tannins.

The present state of knowledge with respect to the distribution of tannin plants leaves much to be desired. The lack of information is not confined to the conditions in the less accessible tropical countries alone, but is evident also wherever it becomes desirable to secure full details concerning the production, handling and utilization of any tannin plant. In the judgment of the writer there is less need for concern regarding the possible exhaustion of the natural supply of tanning materials than for a practical solution of the problem of how to bring them into the market on terms that do not work a hardship either to producer or to consumer. So long as these mate-

[4] Stockberger, W. W., Tannin Plants of Paraguay, *Journal of the American Leather Chemists Association*, April 1912, p. 185–192.

rials can be obtained from untilled or untillable areas of land with the assistance of low priced labor their production as an agricultural crop will probably be very limited. But should economic conditions so change as to enable certain tannin plants to compete successfully with general field crops there is no doubt that large quantities of tanning materials could then be produced on an agricultural basis. It follows, then, that the practical importance of a thorough study of the geographic distribution of tannin plants is two-fold, first, since it will yield more definite information concerning the location and available quantity of existing tannin materials, and second, since it alone can furnish a rational basis for extensive experiments having as their aim the introduction of tannin plants into our present system of agriculture.

PHILADELPHIA COLLEGE OF PHARMACY.

Semi-Annual Meeting.

The semi-annual meeting of the Philadelphia College of Pharmacy was held September 29th at 4 P.M. in the Library, the President, Howard B. French, presiding. Twenty members were present.

The Minutes of the quarterly meeting held June 30th were read and approved.

The Minutes of the Board of Trustees for June were read by the Registrar J. S. Beetem, and approved.

The report of the Committee on Nominations was read and ordered entered and filed.

The report of delegates to the meeting of the American Pharmaceutical Association held at Nashville, Tennessee, August 18–23, in the absence of the Chairman, Professor Remington, was presented by Professor Lowe. A further report was also read by Professor Kraemer.

Professor Lowe said that the sixty-first annual convention of the American Pharmaceutical Association was held in Nashville, Tenn., August 18–23, 1913. The college was represented by the following: Jos. P. Remington, Geo. M. Beringer, E. F. Cook, Joseph W. England, Henry Kraemer, Adolph W. Miller, Clement B. Lowe, F. X. Moerk, and F. P. Stroup. A few of the Eastern delegation went to the meeting by way of Cincinnati in which city they were delightfully enter-

tained by the local pharmacists headed by Professor John Uri Lloyd.

In regard to the meeting Dr. Lowe said that one very practical suggestion of President Day was that the secretaries of the different State Pharmaceutical Associations be invited to meet at the annual convention of the A.Ph.A. to discuss practical plans for increasing the efficiency of the state associations. He also commented on the work which was done at the meeting but as an extended account has already appeared in this JOURNAL for September, the report is not given in further detail. Among the officers of the association for the ensuing year are several members of the college including George M. Beringer, President; Franklin M. Apple, First Vice-President; and E. Fullerton Cook, Chairman of the section on Pharmacopœias and Formularies.

Professor Kraemer read a somewhat extended report on the problems connected with pharmaceutical education which were presented at the Nashville meeting. The purpose of this report, as was stated, was to crystallize out in some concrete form not only the nature of the work which was done but to indicate what was thought should be the proper attitude of the college in regard to the various questions which require more or less immediate attention.

In regard to the alumni dinner at the Hotel Maxwell Professor Kraemer said that this was among the most pleasing events of the meeting. It was an occasion which served not only to unite our members but to show the members from the various sections of the country that each one had a duty to perform if the college was to maintain its prestige and reputation. Our Dean, Professor Remington ('66), presided and brief speeches were made by nearly all of those in attendance. Among those present may be mentioned Dr. John F. Hancock, Professor J. U. Lloyd, Professor C. Lewis Diehl, Professor J. M. Good, Dr. Adolph Miller ('62), Dr. F. E. Stewart ('75), W. P. Porterfield ('78), William Mittlebach ('79), George M. Beringer ('80), F. A. Miller ('83), J. W. England ('83), C. B. Lowe ('84), Frank X. Moerk ('84), E. G. Eberle ('84), J. Fred Windolph ('85), C. A. Mayo ('87), E. V. Howell ('89), H. V. Army ('89), Henry Kraemer ('89), John Culley ('94), Irvin A. Becker ('95), F. P. Stroup ('96), E. F. Cook ('00), H. Lionel Meredith ('00), C. P. Greyner ('96), I. Curtis Arledge ('12), Joseph Rosin.

The several reports were discussed by Messrs. Beringer, French and Lowe and then ordered entered and filed.

The Committee on Membership reported favorably on the appli-

cation of Mr. Elmer H. Hessler to active membership, a ballot being taken, he was unanimously elected.

The President reappointed the Committee on Membership: Charles H. LaWall, William E. Lee and O. W. Osterlund, with the Treasurer and Recording Secretary ex-officio.

The names of those proposed for Honorary Membership at the quarterly meeting in June, and laid over for action at this meeting, were read. A ballot being taken, the following named gentlemen were unanimously elected to Honorary Membership: Dr. Carl L. Alsberg, Chief of the Bureau of Chemistry, U. S. Department of Agriculture, Washington, D. C.; Andrew L. Winton, in charge of the Government Laboratories at Chicago, Illinois; Heinrich Zornig, Apothecary and Curator of the Imperial Plant Physiological Institute at Munich, Germany; Ernest Gilg, Professor in the Pharmazeutische Institute, University of Berlin, and Curator of the Imperial Botanical Museum of Berlin. Erwin F. Smith, Author, and Director of the Laboratory of Plant Pathology of the U. S. Department of Agriculture, Washington, D. C.

Mr. Joseph W. England read the following memoir of William Theodore Wenzell, which was ordered entered and filed.

William Theodore Wenzell, of San Francisco, died at the age of eighty-four years on July 31, 1913, at Lane Hospital. He had been actively engaged in his work as Chemist in the Appraiser's Stores, San Francisco, up to the time of his short illness. Mr. Wenzell was born at Muhldorf, Germany, in 1829, and came to this country when a child, graduating from the Philadelphia College of Pharmacy in 1855, the subject of his theses being Corydalis Formosa. In 1864 he received the M.D. degree from the LaCrosse Medical College, Wisconsin. He also received the M.D. degree from the Medical College of the Pacific in 1876. In 1872 he was made Professor of Chemistry and Toxicology of the California College of Pharmacy which position he held till 1898. From 1875 to 1880 he held a similar chair in the Medical College of the Pacific, also in the Cooper Medical College from 1897 to 1902. In 1899 he was appointed a Chemist to the United States Appraiser's Stores which position he held up to the time of his death. He was a life member of the American Pharmaceutical Association, joining in 1870. He has contributed a number of valuable papers to American Pharmacy.

Election of Three Trustees. The report of

The Committee on Nominations was read and Messrs Osterlund

and England were appointed tellers. After some discussion in reference to reopening the nominations, a ballot was taken, the tellers reporting the re-election of E. M. Boring, Theodore Campbell and Charles Leedom to membership in the Board of Trustees for the ensuing three years.

Professor Kraemer referred to the valuable publications emanating from the Hygienic Laboratory, United States Public Health Service, Washington, D. C., and called especial attention to the Digest of Comments on the Pharmacopœia of the United States and on the National Formulary, the one just received being for the year 1911, and moved that the Librarian be instructed to convey the thanks of the College to the Surgeon General, so ordered.

The President called attention to the improvements made to the Library, and to other portions of the College and praised the Committee for the excellent work they had accomplished.

C. A. WEIDEMANN, M.D.,

Recording Secretary.

ABSTRACTS FROM THE MINUTES OF THE BOARD OF TRUSTEES.

June 3rd. Sixteen members were present.

Committee on Museum and Herbarium reported having received a number of volumes of the Proceedings of the American Pharmaceutical Association. Mr. Boring stated that several volumes of the "Proceedings" also Reports of the Pennsylvania Pharmaceutical Association had been received from Mrs. William McIntyre. Acknowledgments of these gifts were made to the donors.

Committee on Instruction presented a detailed report from Professor Moerk covering several phases of the course in his department. They also advised that it would be necessary to import a considerable amount of required glassware for the Chemical Laboratory and that some repairs were needed. The matter of supplies and repairs were referred to the appropriate committees, with power to act.

The Chair deemed it advisable, in view of Professor Moerk's position as Assistant Dean and his interest in all matters pertaining to the College, that he be asked to be present at the meetings of the Board. This being put in the form of a motion was adopted.

Supplies for the Chemical Laboratory and estimates for supplies

for the department of Bacteriology were referred to the Committee on Supplies with power to act.

Committee on Announcement reported that the catalogue number of the Bulletin was in press and would be ready for distribution in a few days.

Professor Sadtler for the Committee on Publicity reported that various communications had been forwarded to the Alumni and good results were apparent.

Committee on Commencement reported a successful Commencement, and moved that resolutions of thanks be extended to those who had rendered services. It was so ordered.

The Committee stated that June 18th, 1914, was the day fixed for the next Commencement, and moved that the Treasurer be authorized to engage the Academy of Music for the occasion. It was so ordered.

Mr. Joseph W. England stated that Mr. C. M. Kline desired to change the title of the Mahlon N. Kline prize to read "The Mahlon N. Kline Pharmacy Prize offered by the Mahlon N. Kline estate." It was so ordered.

Mr. French presented framed photographs of Sir William Ramsey and Lord Kelvin which were received with the thanks of the Board.

Dr. John A. Roddy (nominated at a prior meeting of the Board) was unanimously elected Professor of Bacteriology. It was also ordered that the new Department be known as the Department of Bacteriology and Hygiene.

BOOK REVIEWS.

THE VOLATILE OILS. By E. Gildemeister and Fr. Hoffmann. Second Edition by E. Gildemeister. Written under the auspices of the firm of Schimmel & Co., Miltitz near Leipzig. Authorized translation by Edward Kremers, Madison, Wisconsin. First volume. With two maps and numerous illustrations. New York: John Wiley and Sons Inc., 432 Fourth Ave., 1913. $5.00.

The first volume of the second German edition of Gildemeister's "The Volatile Oils" was reviewed in this JOURNAL in 1910 (p. 581), so that our readers are doubtless familiar with the scope and contents of this work. It is very fortunate for students of essential oils

in Great Britain and the United States that we have this excellent translation by Professor Kremers. This work has come naturally to be looked upon as a standard and is relied upon in practical work. Students of plant chemistry, as well as of the volatile oils, owe a very great debt to Messrs. Schimmel & Co. for publishing in such excellent and permanent form the results of the investigations in their own laboratories. They might like many other manufacturers have kept much of this information for their own benefit. It would have spared them not only a very great expense, but a great amount of worry and anxiety. They preferred, however, to give to science the results of their labors. In the giving of this they have not only enriched science and chemical industry but they done an ennobling work which will stand as a monument to this firm. It is an example that well might be emulated by all of the large manufacturing houses.

H. K.

TREATISE ON GENERAL AND INDUSTRIAL ORGANIC CHEMISTRY. By Dr. Eltore Molinari. Translated from the second enlarged and revised Italian edition by Thomas H. Pope. With 506 illustrations. Philadelphia: P. Blakiston's Son & Co., 1913. $6.00 net.

While it is true that there are several excellent English and American works on "Industrial Organic Chemistry," Molinari's "Trattata di Chimica Organica" has been highly esteemed by very many European workers. It was Liebig who expressed the thought that "to obtain a sound practical man it is necessary to train a good theorist." Molinari amplifies this maxim to meet modern needs by saying: "In order to produce, rapidly and with increased certainty, a sound, practical man, it is necessary to train a good theorist and to initiate him into both the theoretical and practical study of the more salient industrial problems." This is the keynote of the present work. With a knowledge of various syntheses and constitutional formulæ of a commercial product, he claims that the chemist should also possess a knowledge of industrial processes as well as the statistics of production. In this work we find a lot of fundamental information of a general scientific character concerning organic compounds and this is frequently supplemented by industrial processes of the more important substances considered. The author dwells preferably on the industries of illuminating gas, sugar, alcohol, beer, acetic acid, dyeing, textile fibres, fats and soaps, explosives, etc.

In the English translation Professor Pope has made a number of alterations in and additions to the text of the second Italian edition, these consisting principally in amplification of the statistical data referring to Great Britain and the United States. H. K.

MODERN RESEARCH IN ORGANIC CHEMISTRY. By F. G. Pope. With 261 diagrams. New York: D. van Nostrand Company, 1913. $2.25 net.

In an introductory note by J. T. Hewitt in this volume it is stated that " in the course of the past century the study of organic chemistry has been pursued with an energy which has not been exceeded in any department of science, and, by sustained effort, not only has a better insight been obtained into processes of life, but many branches of industry have been revolutionized." The student of research plays an important part in the development of science, but it is very fortunate there are those who are willing to take the time to survey the field of research, delve into the published papers and after assimilating and boiling down the facts give us the fruits of their labors. The present volume is one of these indispensable books that is stimulating indeed. How inspiring to the student are the words of Mr. Hewitt in his introduction wherein be says: " Organic chemists have achieved much, and as the habit of simply recording the melting-points and analytical data of new compounds dies out, it will be more clearly recognized what an enormous field of work lies in front of us."

Among the subjects considered the following may be mentioned: the polymethylenes; the terpenes and camphors; the uric acid or purine group; the alkaloids; the relation between the color and constitution of chemical compounds; salt formation of pseudo-acids and bases; the pyrones; ketens, ozomides, triphenylmethyl; the Grignard reaction; etc. H. K.

MATERIA MEDICA, PHARMACOLOGY, THERAPEUTICS AND PRESCRIPTION WRITING. By Walter A. Bastedo, Ph.G., M.D., Associate in Pharmacology and Therapeutics at Columbia University. Octavo of 602 pages, illustrated. Philadelphia and London: W. B. Saunders Company, 1913. Cloth, $3.50 net.

This work of Bastedo's on " Materia Medica; Pharmacology, Therapeutics and Prescription Writing," shows a great amount of

reading and is a very excellent attempt to co-ordinate the results of scientific pharmacology with rational therapeutics. The point of view of the author is like that of the more advanced teachers in the United States and he has succeeded in giving us a work that will command the attention of students in both our colleges of pharmacy and medical schools. H. K.

HANDBOOK OF THE HISTORICAL MEDICAL MUSEUM. At the 17th International Congress of Medicine held in London this year there was exhibited, for the first time, the Historical Medical Museum organized by Henry S. Wellcome. This museum contains objects of historical interest connected with medicine and allied sciences and a careful perusal of the handbook will show that many phases of the healing art are represented from the earliest to more recent times.

This handbook contains the usual picture of Hippocrates and a plan, illustrating the general arrangement of each section and the itinerary is in accord with the sequence of objects described. Evidently, judging from the index, the museum consists of an abundance of tremendously interesting objects, objects that would make glad the heart of a lover of things historical. Water color drawings, engravings, oil paintings, statuary, and carvings both in ivory and wood, having for their theme some connection with the art and science of healing are much in evidence.

Among the pictures listed of special interest to pharmacists mention might be made of the "The Drug-Market at Constantinople"; "The Apothecary" by an unknown painter of the Dutch school; "Interior of an Italian Pharmacy," 16th century; "Ergot of Rye," a series of pictures showing its development; "Discovery of Quinine," showing Pelletier and Cavanton in their laboratory; a portrait of "Joseph Priestley," the discoverer of oxygen; "Leuwenhoeck with his Microscope," who described minute living organisms and laid the foundations of the science of Bacteriology; "Christopher Wren making his first demonstration of a method of introducing drugs into a vein, before Dr. Willis, 1667"; "Dioscorides, the Greek Father of Pharmacy, describing the method of gathering, and the properties of the mandrake." If the large number of illustrations of this drug contained in this handbook is any criterion, mandrake must have been a much-used remedy in early medical times. Many pictures of Harvey and other great thinkers of early times who by their work made modern medicine possible are also exhibited. One

in particular an engraving of Harvey demonstrating his theory of the circulation of the blood to King Charles.

On the ground floor of the museum is shown a London Pharmacy of the 18th century, the shop front of which is the original of the pharmacy established in 1798 by John Bell, founder of the Pharmaceutical Society of Great Britain.

So many and varied and of such interest are the things indexed that one longs for an opportunity to visit old London and see for himself this Historical Medical Museum.

JOHN K. THUM.

CURRENT LITERATURE.

SKIN RASHES FOLLOWING THE ADMINISTRATION OF ATOPHAN.

Skin rashes, similar to those following the administration of antipyrin, are not uncommon after atophan has been taken. As this drug has been recommended as of value in the treatment of urticaria the report of five cases, by Phillips of Western Reserve University Medical Department, showing the occurrence of various skin rashes—purpura, urticaria, and scarlatiniform eruptions—is timely.—*Journal A.M.A.*, Sept. 27, 1913, page 1040.

OZONE.

In a very interesting paper on the bactericidal action of ozone Jordan and Carlson record some experiments to determine the value of this gas. As an aid to the destruction of bacteria they found it of little or no use. They also make the statement that it has no practical value for room disinfection. This statement is doubly interesting because ozone has been recommended by interested parties as of value for air purification of occupied rooms. The results of the author's experiments lead them to believe that human beings are injuriously affected by amounts of ozone far less than are necessary to produce even slight bactericidal effects.—*Journal A.M.A.*, Sept. 27, 1913, page 1007.

ESTIMATION OF ACIDITY OF TINCTURE OF IODINE.

A definite weight of the tincture, 50 grams for instance, is mixed with eight times its weight of distilled water and, after standing one hour, filtered. The liquid thus freed from the precipitated iodine

is shaken with a small excess of barium carbonate. The whole of the free hydriodic acid is thus converted into soluble barium iodide, which in turn is precipitated as barium sulphate; 100 of barium sulphate corresponds to 109 of hydriodic acid. By this method, it was found that a tincture which had been exposed in a colorless bottle to the diffused light of the laboratory for 9 months, showed the presence of hydriodic acid to the extent of 1.42 per cent.—*Jour. Pharm. Chim.*, July 16, 1913, page 75.

French Otto of Rose.

Bulgaria's calamity has proved France's opportunity. For generations the perfumery world has drawn its supplies of otto of rose from the Balkan States, and up to a few years ago we were taught to believe that nowhere else on earth were climatic conditions favorable to its production, but this summer we are being treated to French otto of rose of excellent quality and at a comparatively low price. From our friends, Vimard, Dhumez and Monschein, of Vallauris (Alpes Maritimes), we have just received two samples of otto of rose of guaranteed purity. One of these samples, prepared exclusively from one species of rose, has the following characters:

Specific gravity at 25° C.	0.8717
Optical rotation	6° 40′
Melting point	over 22° C.

The other specimen, prepared from bulked deliveries of various kinds of roses, gave the following figures:

Specific gravity at 25° C.	0.8679
Optical rotation	3° 30′
Melting point	over 23° C.

Although the makers are not able to state the proportions of the various species of flowers employed, they are quite prepared to guarantee the purity of the product, and one is at a loss to account for the difference of the figures for the optical rotation. Although the rotation of the sample first described is about the same as that of an essence distilled from "roses de Mai," that of the specimen prepared from the mixed flowers corresponds closely to the figure for Bulgarian otto.

We learn that the French perfumes are largely adopting these new essences for their specialties, the fact that there are differences between these and the Bulgarian products being of little moment. Just at present, of course, while the enterprise is in its infancy, the amount of product is small, but with a rich supply of material, perfected machinery, scientific control, and the business acumen to be found in France, there is every reason to anticipate a larger output next year, and still another anxiety for Bulgaria.—*Perfumery and Essential Oil Record,* August 30, 1913, page 265.

NOTES AND NEWS.

An International Pharmacopœal Bureau.—At the recent International Congress of Pharmacy, a proposal to form an International Pharmacopœal Bureau was discussed and a commission was appointed to consider the question and to submit to the International Pharmaceutical Federation at an early date a scheme for the establishment of such a bureau. Among the duties of such a bureau, as that proposed, would be the collection and examination of all literature relating to pharmacopœal revision, the experimental investigation of new drugs and preparations, and no doubt the influence of the bureau would tend to encourage the work already commenced in the direction of the unification of pharmacopœias. The commission is composed of seven members, representing respectively, Belgium, France, Germany, Great Britain, Holland, Switzerland and the United States; most of the members are associated with the revision of their national pharmacopœias, the American representative being Prof. Joseph P. Remington, Chairman of Committee of Revision of the Pharmacopœia of the United States of America.

Raising the Standard of Medical Practice.—A gift of $1,500,000 from the General Board of Education to the Johns Hopkins Medical School is to provide an income that will put the heads of departments on salary and eliminate all private fees. The gift is named after Dr. William H. Welch and his idea is that the new medicine wants men who will be too busy in the great field of research to think about money.

This is splendid idealism in the age of the practical: it is the true spirit that will urge medical progress to its possibilities and the resultant good to the human race will be incalculable.